METHOD OF MAKING RIM HAVING OPPOSITE HOLLOW FLANGES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method of making a rim having opposite hollow flanges formed on its circumference.

2. Related Art

Almost all rims for motorcycles are of aluminum, but steel rims are still used widely. A variety of steel rims used are different in cross sections. One of the principal steel rims is called "W"-type rim. It has two opposite hollow flanges "a" formed on its annular circumference, as shown in Fig.5(a). The tyre bead is fitted on the hollow flanges "a" of the rim.

Another principal steel rim is called DC type rim. It has opposite projecting flanges "b" rising from the outer edges of the annular circumference, as shown in Fig.5(b). This flange "b" of the DC type rim has a reduced strength, compared with the hollow flanges "a" of the "W"-type rim. Also, the strength and rigidity of the whole rim body is low, compared with the "W"-type rim.

Advantageously DC type rims can be made by a multi-stage roll system. Small-sized "W- type rims however, cannot be made by such a multi-stage roll system; their hollow flanges cannot be correctly shaped. Referring to Fig.6, a strip of steel needs to be partly worked by a series of rolls sequentially (15 to 20 steps) until it has been given a required shape in cross-section. The semi-final shaped object is curved to be given a required curvature, and then the ring is cut.

The cut ends are flash butt-welded to provide an annular rim. The annular rim is corrected in roundness, followed by five to six steps including removing the burr or flash from the welded cut. Then, the whole rim body is polished, and nipple bosses and holes are formed in the polished rim to stretch the spokes across the ring. Finally the rim is subjected to the surface treatment.

As described above, a strip of steel needs to be subjected to the 15 to 20 forming steps to be given the cross-section as shown in Fig.5(a). The so-shaped strip of steel has a hollow flange "a" formed on its annular circumference. If the flange is relatively large in width, and if the final annular product is relatively small in

size, the shaped steel strip cannot be rolled into the rim without twisting and deforming its hollow flange.

Also disadvantageously the burr-removing-and-polishing of the welded cut ends of the rim cannot be automatized. This step must be performed manually, and therefore, the manufacturing cost increases, and the product quality cannot be guaranteed to be same.

One object of the present invention, therefore, is to provide a method of, with precision and efficiency, making a small-sized rim having a hollow flange formed on its annular circumference. The method can be equally used in making such rims of steel and aluminum.

SUMMARY OF THE INVENTION

A method of making a rim having hollow flanges formed on its opposite annular edges according to the present invention comprises the steps of: cutting an elongated metal band of a fixed width to provide metal strips of a predetermined length; rolling a selected metal strip of the predetermined length into a ring; welding the opposite ends of the so rolled metal strip, curling each annular edge of the ring diametrically outward; and rolling the main annular part of the ring into a required shape. The required shape is a well defined at the center of the main annular part. The method further comprises the steps of bending bead areas bordering the center well; rolling each curled edge to form the hollow flange; and unbending the opposite bead areas. Otherwise, it further comprises the steps: rolling each curled edge to form the hollow flange; and raising each hollow flange to give the final rim shape to the ring.

The opposite ends of the rolled steel strip can be welded easily for instance by flash butt-welding; the required welding is linear along the abutting line, and can be automatized. Friction welding can be used, also.

Each annular edge of the ring can be curled diametrically outward by pushing the ring on the opposite sides with conical tools. One to four roll-forming steps follow, much smaller in number than the conventional method.

The method according to the present invention can be used in making small-sized rims of relatively large width. Needless to say, it can be used in making large-sized rims of relatively small width.

Other objects and advantages of the present invention will be understood

from the following description of one preferred embodiment, which is shown in accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

Fig.1(a) is a perspective view of an elongated length of steel; Fig.1(b) is a similar perspective view of a predetermined length of steel cut and separated from the belt-like elongation of Fig.1(a); Fig.1(c) is side and front views of the open ring; and Fig.1(d) is side and front views of the closed ring;

Fig.2(a) is a sectional view of the edge-curled ring taken along a selected diameter of the ring whereas Fig.2(b) is a front view of the edge-curled ring;

Figs.3(a) to 3(e) illustrate how an edge-curled ring can be roll-formed sequentially;

Figs.4(a) to 4(c) illustrate how another edge-curled ring can be roll-formed sequentially;

Figs.5(a) and 5(b) illustrate conventional rims; and

Fig.6 shows a series of steps for making a hollow-flanged rim according to the conventional method.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring to Fig.1(a), a coiled band steel 1 having a fixed width "M" and thickness "T" is prepared. When aluminum rims are made, coiled band aluminum is prepared.

Referring to Fig.1(b), the band steel 1 is cut to provide steel strips of a predetermined length "L", which is equal to the circumference of the rim to be made.

Referring to Fig.1(c), a selected steel strip of the predetermined length is bent into a ring with a bender. As shown, the ring has an aperture 2 between the opposite cut ends.

Referring to Fig.1(d), the open ring is closed, and the abutting ends 3a and 3b are flash butt-welded. The burr or flash is removed from the welded portion 4 to be flush with the inner, outer circumferences 5 and 6, and with the opposite sides 7. For instance, the burr or flash is removed by shaper tools while around the welded portion 4 is clamped.

Referring to Fig.2, after finishing the process at the welded portion 4 as

above, each annular edge of the ring 8 is curled by inserting a conical tool into the ring 8 on each open side, forming the curl 12 on each open side. Then, the edge-curled ring 9 is shaped by a series of rolls, as shown in Fig.3.

Specifically the edge-curled ring 9 is roll-formed to define a well 10 at its center (see Fig.3(a)) as follows: the main annular part of the edge-curled ring 9 is sandwiched between the inner and outer rolls, and the edge-curled ring 9 is rotated to form the well 10 on its main annular part.

The so shaped ring 9 is roll-formed to bend the opposite bead areas 11 toward the center well 10 (see Fig.3(b)).

The ring 9 is roll-formed to make the free edge of each curl closer to the bead area 11, thus substantially reducing the gap 13 between the bead area 11 and the curl edge (see Fig.3(c)).

The remaining gap 13 is closed to define the opposite hollow flanges 15 (see Fig.3(d)). Each flange 15 has a hollow space 14.

The step of bending the opposite bead areas 11 toward the center well 10 (Fig.3(b)) is preliminary for defining the hollow flanges 15. After finishing the roll forming of the flanges 15, the bead areas 11 are unbent to their original flat shapes (Fig.3(e)).

As may be understood from the above, the ring 8 is not directly provided with the hollow flanges, which can be formed via the preparatory step of curling the opposite annular edges. The steps (a) and (c) encircled with broken lines in Fig.3 can be omitted.

Fig.4 shows another manner in which a rim having hollow flanges formed on its opposite annular edges can be made according to the present invention.

Specifically the edge-curled ring 9 is roll-formed to define a well 10 in the center of the main annular part (see Fig.(a)).

The so shaped ring 9 is roll-formed to define the opposite hollow flanges 16 (see Fig.4(b)). As seen from the drawing, the opposite hollow flanges 16 are inclined outward to be apart from the opposite bead areas 11, which border the center well 10.

Finally, the opposite inclined hollow flanges 16 are raised to be in normal positions (Fig.4(c)). The step (a) encircled with broken lines in Fig.4 can be omitted.

Nipple bosses and holes are formed on the rim thus provided to stretch wire

spokes to form a wheel with use of the rim. Otherwise, plate spokes are welded to the inner circumference of the rim.

Rims made according to the present invention can be used for the wheels of motorcycles and other cars such as buggies.

As may be understood from the above, the pre-edge-curling of the rolled steel strip permits opposite hollow flanges to be formed with precision no matter how wide the rim may be, and no matter how small the rim diameter may be. Also advantageously the number of steps required for forming rims is significantly smaller than the conventional method, and accordingly the manufacturing cost can be reduced. Removal of the burr or flash from the linear welded part of the ring is easy.